Tribe V. Oniscoidea.

'a oceanica (Linné), 228.
honiscus pusillus, Brandt, 231.
— - *vividus* (Koch), 232.
—— *roseus* (Koch), 233.
Oniscus asellus, Linné, 235, 236.
Philoscia muscorum (Scopoli), 229.
—— *Couchii*, Kinahan, 230.
Platyarthrus Hoffmanseggii, Brandt, 234.
Porcellio scaber, Latreille, 237.
—— *dilatatus*, Brandt, 238.
—— *pictus*, Brandt, 239.
—— *lævis*, Latreille, 240.
Metoponorthus pruinosus (Brandt), 242.
—— *cingendus* (Kinahan), 243.
Cylisticus convexus (De Geer), 241.
Armadillidium vulgare (Latreille), 244.

Tribe VI. Epicarida.

Bopyrus squillarum, Latreille, 176.
Pseudione Hyndmanni (B. & W.), 182.
—— *confusa* (Norman), 184.
Pleurocrypta longibranchiata (B. & W.), 183.
Athelges paguri (Rathke), 181 and 180, the young.
Phryxus abdominalis (Kröyer), 179.
Ione thoracica (Montagu), 185.
Liriopsis pygmæa (Rathke), 186.
Cryptothir balani (Bate), 187.

IX. — Kerunia, *a Symbiosis of a Hydractinian with a Cephalopod.* By Dr. Francis Baron Nopcsa, Member of the Hungarian Geological Society.

[Plate III.]

During a recent visit to Qasr-el-Sagha, in the Fayum district of Egypt, I succeeded in obtaining a large number of specimens belonging to the Eocene genus *Kerunia* uniting characters which have hitherto not been properly described.

In the first description of *Kerunia,* given by Professor Mayer-Eymar, this fossil was regarded as a Cephalopod, but in a later paper by Dr. Paul Oppenheim it was placed among the Hydractinians. Remarkable peculiarities in the structure of this fossil have brought about this discrepancy of views as to its systematic position in the animal kingdom; but after a careful study of a fairly complete set of specimens I find myself in accordance with Mayer-Eymar, as well as with Oppenheim, and consider *Kerunia* to be both a Hydractinian and a Cephalopod.

(A) Kerunia *inhabited by a Cephalopod.*

Contrary to Oppenheim's criticism on Mayer-Eymar's reconstruction of *Kerunia,* an examination of several examples in the British Museum, in the Museum of the Egyptian Geological Survey at Cairo, in my own collection, as well as a specimen portrayed in one of Oppenheim's figures (Oppenheim, *loc. cit.* p. 46, fig. 1), all exhibit the accuracy of Mayer-Eymar's views, although between the different specimens there exists a good deal of what may perhaps be termed individual variation. *Kerunia* is a bilateral, calcareous, mostly recrystallized mass, always showing, however, a rapidly augmenting, strongly bent, cone-like, median cavity (Pl. III. fig. 6), the outer wall (convex) of which carries in its median line a row of lofty spines (fig. 9), while from each side wall of the cavity mentioned one long spine-like projection is given off (fig. 3). The cone-like cavity, which evidently contained the soft parts of the animal, shows on its internal (convex) side a projecting lip, forming the margin of its opening (fig. 1). The opening itself is sometimes large and somewhat lobate (fig. 1), although quite as frequently round and rather constricted (fig. 4). In one case, to be referred to later on, it is perfectly closed (fig. 10). As shown in figs. 1–10 of Plate III., *Kerunia* is a perfectly regularly built organism, and Oppenheim's aggressive phrase, "Es bedarf daher eigentlich kaum einer Versicherung, dass auch mir nichts Aehnliches vorliegt, und dass es die Phantasie des Autors, nicht wie dieser meint, diejenige der Natur war, welche geschäftig dieses Fabelwesen geschaffen hat," is entirely without foundation.

Looking over my specimens of *Kerunia* with Mr. R. Bullen Newton, of the British Museum, to whom all students of Dibranchiata are greatly indebted for his very useful paper (written in conjunction with Mr. G. F. Harris) "A Revision of the British Eocene Cephalopoda," he at once indicated to

me the great resemblance that existed between *Kerunia* and the Middle Eocene *Belosepia* found in the Bracklesham beds of England. *Belosepia* seems to differ from *Kerunia* mainly by the absence of lateral horns and by the fact that the front median spines of *Kerunia* are represented in *Belosepia* by several rows of irregular tubercles. The last and principal horn of *Kerunia* is, however, present in the British Eocene genus.

Fig. 1.

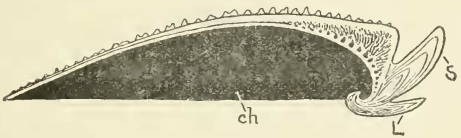

Fig. 2.

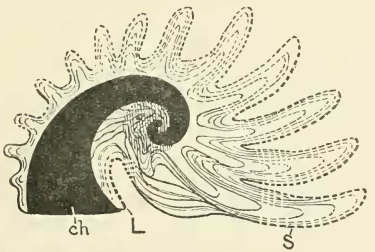

Fig. 1. Longitudinal section of *Belosepia* ($\frac{3}{4}$ nat.). Fig. 2. Longitudinal section of *Kerunia* ($\frac{3}{4}$ nat.).

The unshaded surface indicates the calcareous substance and lines of growth; the shaded surface (in fig. 2) is the region where the lateral spines are given off; the black surface shows the chamber containing the soft parts of the animal. L=ventral lip; S= principal spine in *Kerunia* (=rostrum in *Belosepia*); *ch*=chamber. (The parts marked in fig. 2 by dotted lines are not preserved.)

To prove the morphological resemblance of *Kerunia* and *Belosepia* I have thought it best to figure two cross-sections representing both organisms together (text-figs. 1 & 2). These exhibit the turned-back ventral lip, separated from the first spine by a deep transverse cleft, and beyond this first spine in *Belosepia* rugosities are visible, while in *Kerunia*

some more spines are developed. Internally both fossils are furnished with the bent cone-like chamber which in *Belosepia* has a much shorter ventral side than characterizes *Kerunia*; therefore in this latter genus the cone appears to be much more complete and more involute than in *Belosepia*. Thus, though the lateral horns of *Kerunia* are absent in *Belosepia*, still the similarity is striking. Moreover the bilobate opening of *Kerunia* (Pl. III. fig. 1) is fairly safe evidence that the internal chamber of this organism was inhabited by a *Belosepia*-like animal. The growth of *Kerunia* occurred by thin layers of calcareous matter superimposed one above the other over the whole body, so that at the same time the oral opening was shifted forwards and the different spines augmented in height and length. No new layers were formed on the inside wall of the chamber, except close by the mouth, where sometimes a constriction resulted. That the formation of new layers was influenced by the animal living in the cone-like chamber is clearly shown by the fact that in the same degree as the oral aperture was shifted forward new spines were developed in the median line, one in front of the other. In some cases, however, double spines were developed, that is, one or two on each side of the median line (fig. 4).

As the new layers which augmented the size of *Kerunia* showed different thicknesses, the first small dorsal spines slowly got covered up, and it is thus explainable that the hindermost free spine of the dorsal row (the one nearest to the ventral lip) is always the strongest, while the more posterior spines form a breast-like projection. In large or old specimens the lateral spines show branch-like protuberances or outgrowths (fig. 5), and as the number of these outgrowths augments an irregular body is formed resembling somewhat the horns of an elk with its pointed ends turned upwards (fig. 6). On such occasions it also happens that the basal region of the lateral branches in medium-aged specimens (fig. 1), which exhibit a certain amount of flattening, becomes perfectly flat and united with the breast-like projection (fig. 7). Then it is that remarkable asymmetry occurs, the dorsal spines branch off in quite a posterior direction high above their base, and frequently again become irregularly united (fig. 8).

Taking all these facts into consideration, I am unable to acknowledge *Kerunia* as a Hydractinian: first, because of its regular shape; secondly, on account of its external resemblance to *Belosepia*; and, thirdly, from its regular growth on the plan of a *Belosepia*-like organism.

The regular shape of *Kerunia* and its external resemblance

to *Belosepia*, as well as the continuous development of new spines near the shifting oral opening, are characters which prevent us from assuming that it is the result of a Hydractinian covering some Gastropod or other animal in the manner quoted by H. J. Carter and others, because in such cases irregular masses are the only result.

(B) Kerunia *a Hydractinian.*

Though it was rather easy to prove in the previous remarks that *Kerunia* could not be a simple Hydractinian, it is probably easier to demonstrate that this organism could have been nothing else. The internal structure of *Kerunia* throughout the entire fossilized body, as shown by different sections, is everywhere exactly the same and without any sign whatever of a shell-like centre. Agreeing altogether with Hydrozoan structure and perfectly unlike the dense shell of *Belosepia**, *Kerunia* is built up of concentric layers, showing a tubular structure (fig. 11). The tubulæ of the different layers are always directed so as to point vertically towards the external surface of the more internal layer, and through irregular tubes of similar size they are in communication with each other. The outermost layer is capable of covering Balanids and other animals that adhere to its surface, forming another fact which forcibly reminds us of Hydractinian affinities.

As already remarked by Oppenheim, there can be distinguished on the external surface of *Kerunia* low spine-like defences, pits for the single individuals, and small channels corresponding to the sarcorhiza. The tubercle-like defences show clearly small convergent riblets, and are mostly accumulated on the bottom or more flattened surface, the pits are more numerous on the top, while the dense network formed by the sarcorhiza seems equally spread out over the whole body; but none of these elements appear to be present in the cone-like chamber. Since Oppenheim's sketch gives but a poor representation of the delicate surface-sculpture of our animal, it is considered necessary to introduce a micro-drawing of a portion of the surface of *Kerunia* (fig. 12), where a great resemblance will be observed to Vinasso de Regny's illustration of the external structure of *Cyclactinia*† *incrustans*. At the same time it should be observed that *Cyclactinia incrustans* is the single Hydractinian species giving off *Kerunia*-like ramifications.

* *Beloptera* seems to be less dense in its shell-structure.

† This genus, according to Oppenheim, belongs to *Hydractinia*.

A specimen of *Kerunia* in the British Museum collected by Dr. C. W. Andrews has the aperture of the conical chamber not only constricted but perfectly closed up by Hydractinian structure (fig. 10), proving that the outer layer continued growing and developing even after the death of the problematical organism that occupied the cavity. In this case, therefore, the Hydractinian growth along the oral opening developed irregularly over the surface of the fossil as characterizes a true Hydractinian.

The study of such an example of irregular growth amply proved by its microscopical structure, both internal and external, leads to the inference that the animal which formed these calcareous masses must have been a Hydractinian.

(C) *Conclusion:* Kerunia *a Symbiosis.*

There is only one way of merging these two results as set out in the A and B divisions of this paper, and that is by assuming that *Kerunia* resulted from a remarkably close symbiosis of a *Belosepia*-like Cephalopod with an encrusting Hydractinian, in which case symbiosis went so far that the Hydractinian overtook the labour of building up the protective shell of the Cephalopod which fixed or controlled to a certain extent the growth of the Hydractinian.

Only by the death or incapacity of the Cephalopod could the Hydractinian develop in an irregular, and in consequence also an asymmetrical, manner.

Perhaps the symbiosis of Hydractinians with *Pagurus* may also throw some light on these biological questions.

This explanation of *Kerunia* is of necessity only a hypothesis, and yet it seems more probable than any other theory we can advance, since the phenomenon of symbiosis may be traced among recent Hydractinians, as, for example, *H. lævispina*, which has the tendency to destroy the Gastropod shell on which it settles. Besides, the symbiosis hypothesis only can account for the otherwise most remarkable fact that among the numberless *Kerunias* I have examined no two specimens were precisely alike.

The locality where I found the *Kerunias* here described and figured was the second low terrace above the temple ruins of Qasr-el-Sagha. The specimens occur in great quantities in an oyster-bed (*Alectryonia Clot-Beyi*, Bellardi) and are always found with their oral openings and the flattened side downwards, so that the dorsal spines and the ends of the somewhat twisted lateral horns are turned upwards as weapons

of defence. Such an occurrence would make it possible that during life *Kerunia* existed on a sea-bottom with its head downwards.

Before finishing this short note I would like to express my hearty thanks to Mr. R. B. Newton for the great kindness he has shown by giving me many valuable suggestions as well as by undertaking the very tedious work of revising the manuscript and proof-sheets of this paper.

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EXPLANATION OF PLATE III.

Fig. 1. *Kerunia*, basal view, showing ventral lip and large oral opening.

Fig. 2. The same, posterior view, showing section of median part of chamber and fractured surface for main dorsal spine.

Fig. 3. Another specimen, showing breast-like projection and constricted oral opening.

Fig. 4. Another specimen, showing perfectly preserved oral opening with fractures of numerous symmetrically placed spines.

Fig. 5. Distal end of a lateral spine exhibiting ramification.

Fig. 6. An irregular specimen, showing internal chamber and complex ramification of both lateral branches, dorsal aspect.

Fig. 7. The same, giving basal view and showing flattened internal surface.

Fig. 8. Part of a dorsal spine of another specimen exhibiting ramification.

Fig. 9. Dorsal aspect of small example, showing dorsal and lateral spines.

Fig. 10. Front view of same specimen, showing a perfectly closed oral opening.
Fig. 11. Longitudinal median section of another specimen, illustrating tubular structure, enlarged.
Fig. 12. Enlarged surface-drawing of the specimen figured in figs. 1 and 2.

The figures are drawn half the natural size of the specimens with the exception of 11 and 12, which represent magnified structures. Figures 9, 10, and 11 refer to specimens in the British Museum, the remainder being in the Author's collection.

MISCELLANEOUS.

The Nomenclature of Types in Natural History.

By Charles Schuchert and S. S. Buckman.

Practical work on the arrangement and cataloguing of "types" and other museum material has shown us that the present nomenclature is not yet sufficient for critically distinguishing all the different classes of such specimens. Further, some of the terms which have been proposed for the purpose are already employed in other ways—for instance, *homotype* is in use in biology, *monotype* is the name of a printing-machine, *autotype* is the term for a printing-process. We wish, therefore, to submit the following system of nomenclature, and we hope that in making it more complete we have provided a scheme which will render efficient service in the labelling and registration of types and typical material.

The terms printed in broad-faced letters are the additions or modifications for which we are at present responsible. A fuller explanation of all the terms will be found in the 'Catalogue of the Types and Figured Specimens of Invertebrate Fossils in the U.S. National Museum,' a work which has been prepared by Charles Schuchert and is now passing through the press. The present article gives a synopsis of the terms which it has been found necessary to use in connexion with that and similar work.

We now make another suggestion. After the different terms we have placed in circles the contractions which we propose should be used in the actual marking of small specimens, to which it is impossible or inadvisable to affix the full label. Our plan for such contractions is this:—For types of the first class two capital letters; for those of the second class one capital and one small letter; for typical specimens two small letters.

In the definitions which follow, the term description indicates either a description by words or by a picture, or by both combined. For the sake of accuracy, we suggest that the original description by words (type-description) be called the **protolog,** the original